

TECHNICAL MEMORANDUM

To: Nevada Environmental Response Trust

Cc: Dan Pastor, Tetra Tech, Inc.

From: April Hussey

Date: February 28, 2018

Subject: Operation and Maintenance Summary – January 2018
Weir Dewatering Treatment Plant
Nevada Environmental Response Trust; Henderson, Nevada

The Southern Nevada Water Authority (SNWA) is completing two weir construction projects in the Las Vegas Wash, the Sunrise Mountain Weir and Historic Lateral Weir. SNWA has hired a construction company, Las Vegas Paving (LVP) to perform weir construction activities. This includes constructing diversion channels to divert the Las Vegas Wash and perform construction dewatering activities. The Nevada Environmental Response Trust (NERT or Trust) has been ordered by the Nevada Division of Environmental Protection (NDEP) to treat the groundwater from the construction dewatering activities to remove perchlorate before discharging the treated water to the Las Vegas Wash.

To manage and treat groundwater from the construction activities, Tetra Tech, Inc. (Tetra Tech) designed and constructed two pump stations and a central water treatment plant (CWTP), collectively referred to as the SNWA Weir Dewatering Treatment Plant (Treatment Plant). The Treatment Plant will operate on a temporary basis, and operations will cease once groundwater dewatering associated with the SNWA weir construction projects is complete.

At the direction of NERT, Tetra Tech has prepared this summary of the operation and maintenance (O&M) activities performed during January 2018 for the Treatment Plant. The system was operated and maintained in accordance with the *NERT – SNWA Weir Dewatering Water Treatment Plant Operation and Maintenance Manual*.

SUMMARY OF O&M ACTIVITIES

Startup of the Treatment Plant was achieved on January 2, 2018 and the Treatment Plant received water from weir construction dewatering activities at both the Sunrise Mountain and Historic Lateral Weirs during the month of January 2018. The Treatment Plant began receiving water from the Historic Lateral Weir construction site via the Historic Lateral Pump Station (HLPS) on January 2, 2018. Construction at the Sunrise Mountain Weir began delivering water to the Sunrise Mountain Pump Station (SMPS) on January 8, 2018. On January 9, 2018, a large rain event caused high flows in the Las Vegas Wash and disrupted LVP's construction operations at both the Sunrise Mountain and Historic Lateral Weirs. As a result, LVP suspended dewatering activities for approximately 6 days. Flow to the SMPS resumed on January 15, 2018, and flow resumed to the HLPS on January 17, 2018.

OPERATIONS

Operations in January 2018 were characterized by intervals of high influent total suspended solids (TSS) concentrations as a result of LVP excavating dewatering trenches and pits. The duration of the high solids load was extended due the large rain event that impacted LVP's construction activities and required additional excavation to restore the diversion channels and dewatering trenches following the rain event. Concentrations of TSS in the water flowing into the Treatment Plant were observed to be as high as 3-4% solids as measured through a combination of field measurements and analysis by a certified laboratory. The TSS concentration in an influent sample from the HLPS was 3.87% as analyzed by Silver State Analytical Laboratories. Treatment Plant National Pollutant Discharge Elimination System (NPDES) water quality samples and influent flowrate monitoring confirmed the operations were in compliance with permit limits during the January reporting period.

Flow Rates

Flow rates for January 2018 are summarized in Table 1. This includes a summary of the flow rate into HLPS, into SMPS, and out of the Treatment Plant. Flow data collected during the project startup period of January 2nd (first full plant operations with groundwater) through January 17th was subject to increased variability as adjustments to equipment were made and facility operation and procedures were being refined.

Historic Lateral Pump Station

Flow rates into HLPS are variable based upon the number of dewatering pumps being used by LVP at the Historic Lateral Weir construction site. Each dewatering pump delivers approximately 800 gpm to the HLPS.

Sunrise Mountain Pump Station

Flow rates into the SMPS were fairly consistent once the dewatering operation at that weir construction site was put into operation.

Influent Parameters

Influent water quality parameters are measured daily for the water coming into each pump station. Influent water quality parameters measured include:

- Perchlorate
- Chlorate
- Total Dissolved Solids (TDS)
- Sulfate
- Nitrate

Perchlorate, chlorate, and TDS are analyzed at a certified laboratory (Test America) in accordance with the Operations and Maintenance Agreement, executed December 31, 2017. Sulfate and Nitrate are also analyzed to

capture a complete evaluation of these influent parameters. Currently, sulfate is analyzed at a certified laboratory until in-house laboratory methods are finalized. In addition, nitrate is analyzed at a certified laboratory except for samples collected on Saturdays, which are analyzed in-house due to the 48-hour hold time. In-house laboratory procedures follow EPA method 300.1 for nitrate. To confirm in-house procedures, 21 samples were split and analyzed for nitrate both in-house and by Test America. The average relative percent differences between the in-house and Test America results for the 21 samples was within 6%, which is within the 30% specified in the approved NERT project Quality Assurance Project Plan. Both sulfate and nitrate may be analyzed exclusively at the in-house lab in the future following confirmation of in-house laboratory procedures.

The range and average of perchlorate concentrations observed during into each pump station during the month were:

- HLPS: 72 to 230 µg/L, average: 157 µg/L
- SMPS: 1,140 to 2,700 µg/L, average: 1,873 µg/L

Table 2 contains the summary data from the daily influent parameter measurements.

Perchlorate Mass Removal Estimates

Daily perchlorate mass removal estimates were calculated from the recorded total influent flow to the SMPS and HLPS and daily measurements of perchlorate (analyzed at Test America by Method 314.0). The mass removed was calculated based on an effluent perchlorate concentration of zero (0) µg/L. The estimated mass of perchlorate removed from each pump station for the period of January 18 to January 31:

- HLPS: 20 pounds
- SMPS: 367 pounds
- Total: 387 pounds

Mass removal estimates were not calculated prior to January 18th, due to data accuracy considerations associated with system start-up and shakedown as noted above. A graph showing the estimated removal of perchlorate is presented in Figure 1.

Suspended Solids Removal and Management

The Treatment Plant was designed to remove the majority of suspended solids from the influent waters via hydrocyclones and multimedia filters (MMF). High TSS waste from the hydrocyclones are stored in the 20,000 gallon cyclone waste tank. High TSS waste from the MMF is generated during the MMF backwash process and is stored in two 20,000 gallon backwash waste tanks. The system is designed to slowly blend in backwash waste and cyclone waste water into the treated effluent stream in small quantities to maintain the National Pollutant Discharge Elimination System (NPDES) permit discharge limits for perchlorate (18 µg/L) and TSS (135 mg/L).

To address the significant solids loading in the waters produced from weir construction, additional surge and storage capacity was mobilized to the site. This included 16 additional 20,000 gallon tanks, placed in individual secondary containment outside the main containment area, as well as pumps, hoses, and tank connections to facilitate the movement of waste water between the Treatment Plant and these tanks. Tanker trucks were also mobilized to haul excess solids to the landfill in accordance with the Treatment Plant design plan for managing excess high TSS waste. In the month of January, 104 tanker truckloads of solids slurry were sent to the landfill, or 478,000 gallons tanker capacity.

MAINTENANCE

Maintenance performed at the Treatment Plant during January 2018 included both routine maintenance activities and non-routine maintenance activities as described in the following sections.

Routine Maintenance

Routine maintenance activities included the following:

- Generators supplying power to the SMPS, HLPS, and CWTP require service approximately every 250 hours of generator run time. Generators were serviced prior to the start of operations, and then during operations as follows:
 - XQ500 – Unit 14, service conducted on January 13, 2018 and January 25, 2018
 - XQ350 – Unit 17 service conducted on January 20, 2018
- Wye strainer was flushed periodically to clear solids accumulation
- Cyclone underflow lines were flushed periodically to clear solids accumulation
- Pump oil changed on Pumps 1A, 1B, 1C, 5A, 7A, and 7B

Non-Routine Maintenance

Non-routine maintenance was performed during January 2018 to improve Treatment Plant operation, including:

- Removed bottom caps on valve actuators to the Ion Exchange vessels 1A, 2A, 1C, and 2C and drained accumulated water on January 18, 2018.
- Adjusted tank level sensor housings to improve performance on January 20, 2018.
- Replaced Ion Exchange 1A pressure control disc on January 23, 2018.
- Tighten bolts on Ion Exchange 1C expansion joint to address seepage within secondary containment on January 30, 2018.
- Tighten flange bolts on MMF1A 18" to 8" reducer on January 30, 2018.

O&M Costs

At the direction of the Trust, Tetra Tech has summarized cost data for the reporting period. The following table summarizes project charges in accordance with the Operations and Maintenance Agreement, executed December 31, 2017. This section only captures project charges consistent with the O&M agreement or agreed upon charges for items supplied by/through Tetra Tech and billed to the Trust.

Table 1: O&M Cost Summary

Item	Payment Details	Unit	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
Monthly Base Cost	Lump sum payable to Tetra Tech	\$297,500 /month	\$297,500	\$297,500
Ion Exchange Resin	Lump sum direct pay from Trust to Evoqua for turn key resin delivery, replacement, transportation and disposal services	\$135,755 /vessel plus NV tax	\$0 (no vessels changed in January)	\$0

Item	Payment Details	Unit	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
Tankage	Actual usage charges direct pay from Trust to Baker Corp and Rain for Rent	Baker Corp: \$20,074 /month plus variable maintenance fees as necessary Rain for Rent: As used	\$0 ¹ \$0 (January to be billed in February)	\$0
Generator Rental / Maintenance	Actual usage charges direct pay from Trust to Cashman	\$625 every 250 run hours per XQ350 Generator \$1250 every 250 run hours per XQ500 plus Backup generator rental costs as required to support maintenance	\$0 ²	\$0
Generator Fuel	Actual usage charges direct pay from Trust to Cashman	\$3.65 /gal delivered plus NV tax	\$0 (January to be billed in February)	\$0
Solids Disposal	Lump sum payable to Tetra Tech for off-site transportation and disposal	\$4,150 /3,000 gallon tanker \$6,917 /5,000 gallon tanker	\$661,261	\$661,261
TOTAL			\$958,761	\$958,761

No other items were supplied by/through Tetra Tech and billed to the Trust during this reporting period.

¹ The Trust pre-paid a sum during Treatment Plant Construction for project tankage to obtain a discount on long-term equipment cost. As of January 1, 2018, the remaining credit balance is \$189,459.85. Additional payment by the Trust will not be required until this prepayment credit is exhausted.

² The Trust pre-paid a sum during Treatment Plant Construction for generator rental/maintenance to obtain a discount on long-term equipment cost. As of January 1, 2018, the remaining credit balance is \$336,598.70. Additional payment by the Trust will not be required until this prepayment credit is exhausted.

CERTIFIED ENVIRONMENTAL MANAGER CERTIFICATION

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been prepared in a manner consistent with the current standards of the profession, and to the best of my knowledge, comply with all applicable federal, state, and local statutes, regulations, and ordinances. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.

Description of Services Provided: Prepared Weir Dewatering Treatment Plant Operation and Maintenance Summary for January 2018.



Feb 28, 2018

Kyle Hansen, CEM
Field Operations Manager/Geologist
Tetra Tech, Inc.

Date

Nevada CEM Certificate Number: 2167
Nevada CEM Expiration Date: September 18, 2018

Tables

Weir Dewatering Treatment Plant
Monthly Flow Summary
January 2018
Table 1

Date	Time	Influent						Effluent ³	
		HLPS		SMPS		Combined Feed ¹		Average ² (FIT8060) gpm	Total (FIT8060) Gallons
		Average ² (FIT3010) gpm	Total (FIT3010) Gallons	Average ² (FIT2010) gpm	Total (FIT2010) Gallons	Average ² (FIT4010) gpm	Total (FIT4010) Gallons		
1/1/2018	23:59	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
1/2/2018	23:59	NA	178,800*	N/A*	N/A*	NA	178,800*	NA	NR
1/3/2018	23:59	NA	1,338,900*	N/A*	N/A*	NA	1,338,900*	NA	1,541,000*
1/4/2018	23:59	NA	2,190,000*	N/A*	N/A*	NA	2,190,000*	NA	2,471,000*
1/5/2018	23:55	NA	2,290,000*	N/A*	N/A*	NA	2,290,000*	NA	3,050,000*
1/6/2018	23:50	NA	2,400,000*	N/A*	N/A*	NA	2,400,000*	NA	3,167,000*
1/7/2018	23:55	NA	1,660,000*	N/A*	N/A*	NA	1,660,000*	NA	2,275,000*
1/8/2018	23:55	NA	2,288,000*	NA	448,000*	NA	2,621,000*	NA	3,391,000*
1/9/2018	23:55	NA	693,000*	NA	400,000*	NA	1,096,000*	NA	1,539,000*
1/10/2018	23:59	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	NA	158,000*
1/11/2018	23:59	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	NA	304,000*
1/12/2018	23:59	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	NA	97,000*
1/13/2018	23:59	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
1/14/2018	23:59	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
1/15/2018	23:59	N/A*	N/A*	NA	269,300*	NA	269,300*	NA	NR
1/16/2018	23:59	N/A*	N/A*	NA	1,036,800*	NA	875,100*	NA	1,130,000*
1/17/2018	23:50	NA	287,500*	NA	578,900*	NA	1,011,600*	NA	1,126,000*
1/18/2018	23:50	342	492,000	1,070	1,541,000	1,357	1,954,000	1,421	2,046,000
1/19/2018	23:55	448	645,700	1,011	1,455,800	1,487	2,140,700	1,614	2,324,000
1/20/2018	23:59	410	590,000	996	1,434,000	1,444	2,080,000	1,595	2,296,100
1/21/2018	23:59	410	590,400	996	1,433,800	1,394	2,007,900	1,563	2,250,200
1/22/2018	23:59	302	434,600	995	1,433,100	1,309	1,885,300	1,478	2,127,600
1/23/2018	23:59	289	415,700	1,106	1,592,700	1,414	2,036,500	1,521	2,190,700
1/24/2018	23:59	326	468,900	1,475	2,124,600	1,827	2,630,900	1,944	2,799,500
1/25/2018	23:59	539	776,500	1,702	2,451,000	2,226	3,205,300	2,413	3,475,400
1/26/2018	23:59	853	1,228,900	1,705	2,454,800	2,563	3,691,400	2,762	3,977,700
1/27/2018	23:59	1,045	1,504,500	1,706	2,456,100	2,737	3,940,700	2,934	4,224,600
1/28/2018	23:59	1,035	1,491,000	1,705	2,455,700	2,744	3,951,900	2,960	4,262,200
1/29/2018	23:59	1,120	1,613,000	1,692	2,437,000	2,817	4,056,000	3,071	4,422,000
1/30/2018	23:59	1,139	1,640,000	1,643	2,366,000	2,776	3,998,000	3,081	4,437,000
1/31/2018	23:59	1,174	1,690,000	1,625	2,340,000	2,785	4,010,000	3,049	4,390,000

Notes:

HLPS = Historic Lateral Pump Station.

SMPS = Sunrise Mountain Pump Station.

NR = Data block not recorded in SCADA data history.

* = Total flow is qualified as potentially less accurate during startup & shakedown period while equipment operations and processes are refined.

NA = Average flows unavailable during startup & shakedown period while equipment operations and processes are refined.

N/A* = No flow received or processed.

FIT numbers presented in column headers correlate with Flow Instrument Transmitter tag numbers for particular flow meters.

Effluent flows recorded between 1/10/2018 and 1/14/2018 generated from municipal water pumped into influent and effluent tanks to clean system during period of no flow received.

Combined flow totals recorded between 1/3/2018 and 1/10/2018 inclusive of pump testing flows

1 - The combined feed is measured by flow indicator FIT4010. This is not equal to the sum of flows from HLPS (FIT3010) and SMPS (FIT2010) due to fluctuating volumes in influent storage tanks.

2 - Average calculated by dividing total gallons by 1,440 (minutes per 24 hours).

3 - Effluent flow meter data is higher than the combined influent flows due to inherent flowmeter variability and is compounded by batch processing operations.

Air drawn into piping (as designed for vacuum breaks) at the end of each pumping batch has been observed to result in transient, short duration high flow readings that are not representative of actual flows.

Weir Dewatering Treatment Plant
Influent Parameter Summary
January 2018
Table 2

Parameter: Units:			Perchlorate ug/L	Chlorate ug/L	Total Dissolved Solids mg/L	Nitrate as NO3 mg/L	Sulfate mg/L		
Location	Collection Date	Lab Sample ID	Result LQ	Result LQ	Result LQ	Result LQ	Result LQ	Comment	
HLPS Influent	1/2/2018	440-199481-1	72 F1	100 U	1600	44	530		
	1/3/2018	440-199547-1	90	13 J	1400	43	490		
	1/4/2018	440-199666-1	150	51	1600	44	490		
	1/5/2018	440-199774-1	170	65	1500	43	520		
	1/6/2018	440-199852-1	180	86	1500	49	500	Nitrate analyzed at Silver State Laboratory due to 48 hour hold time (Saturday collection)	
	1/7/2018	440-199852-2	160	82	1500	44	510		
	1/8/2018	440-199852-3	170	120	1500	49	500		
	1/9/2018	440-200103-2	210	140	1500	44	520		
	No flow 1/10 - 1/17								
	1/18/2018	440-201447-1	112 B	26.0	1710	38.4	646		
	1/19/2018	440-201556-1	106	29.0	1580	39.6	580		
	1/20/2018	440-201635-1	139	47.8	1600	43	590	Nitrate analyzed at Silver State Laboratory due to 48 hour hold time (Saturday collection)	
	1/21/2018	440-201636-1	136	67.4 J	1610	36.0	627		
	1/22/2018	440-201634-1	150	76.3 J	1590	36.3	597		
	1/23/2018	440-201742-1	161 B	76.7	1730	36.6	664		
	1/24/2018	440-201933-1	122	70.7 J	1800	35.9	783		
	1/25/2018	440-201935-1	180	119	1590	37.3	609		
	1/26/2018	440-202065-1	176	119	1610	38.5	595		
	1/27/2018	440-202149-1	157	66.1	1530	39.46	590	Nitrate analyzed by In-House Laboratory (field-filtered nitrate result 38.74 mg/L)	
	1/28/2018	440-202145-1	173	85.7	1530	38.1	571		
	1/29/2018	440-202152-1	192	33.3	1530	39.3	553		
	1/30/2018	440-202246-1/ 440-202297-3	212	138	1550	38.7	585	Chlorate from lab sample ID 440-202297-3	
	1/31/2018	440-202297-1	230	113	1560	39.7	572		
SMPS Influent	No flow 1/2 - 1/7								
	1/8/2018	440-200103-1	2700	300	3900	17	1800		
	1/9/2018	440-200103-3	2500	270	3400	22	1600		
	No flow 1/10 - 1/14								
	1/15/2018	440-201179-1	2670	310	3500	18	1600		
	1/16/2018	440-201177-1	2540	220	3400	18	1400		
	1/17/2018	440-201412-1	2330	273	3500	20.6	1510		
	1/18/2018	440-201413-1	2220	284	3560	21.4	1550		
	1/19/2018	440-201556-2	2060	191	3160	23.0	1410		
	1/20/2018	440-201635-2	1900	165	3190	25	1420	Nitrate analyzed at Silver State Laboratory due to 48 hour hold time (Saturday collection)	
	1/21/2018	440-201636-2	1850	291	3200	23.0	1430		
	1/22/2018	440-201634-2	1910	179	3180	30.5	1400		
	1/23/2018	440-201742-2	1800 B	195	3320	27.5	1390		
	1/24/2018	440-201844-1	1720	241	3140	28.3	1430		
	1/25/2018	440-201935-2	1500	187	3410	24.8	1490		
	1/26/2018	440-202065-2	1470	176	3600	27.7	1380		
	1/27/2018	440-202149-2	1300	199	2990	28.19	1400	Nitrate analyzed by In-House Laboratory (field-filtered nitrate result 28.41 mg/L)	
	1/28/2018	440-202145-2	1310	177	2940	27.9	1450		
	1/29/2018	440-202152-2	1360	193	3030	28.0	1350		
	1/30/2018	440-202246-2/ 440-202297-4	1140	174	3030	30.0	1290	Chlorate from lab sample ID 440-202297-4	
	1/31/2018	440-202297-2	1340	191	2980	31.1	1320		

Notes:
 ug/L micrograms per liter (parts per billion)
 mg/L milligrams per liter (parts per million)
 U Parameter analyzed for but not detected above the reporting limit shown.
 J Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
 B Compound was found in the blank and sample.
 F1 Matrix Spike and/or Matrix Spike Duplicate Recovery is outside acceptance limits.
 HLPS Historic Lateral Pump Station
 SMPS Sunrise Mountain Pump Station

HLPS offline due to rain event 1/9/18 - 1/17/18.
 SMPS brought online 1/8/18 and offline 1/9/18 - 1/15/17 due to rain event.
 Nitrate data presented as NO₃ consistent with terms of O&M agreement.

Figures

Figure 1
Estimated Perchlorate Mass Removed January 18-31, 2018

